

ETW
AR

PTO/SB/17 (12-04)

Approved for use through 07/31/2006. OMB 0651-0032

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Effective on 12/08/2004.

Fee is pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL

For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 500.00

Complete if Known

Application Number	10/669,479
Filing Date	September 24, 2003
First Named Inventor	Steven Goebel et al.
Examiner Name	Robert W. Hodge
Art Unit	1746
Attorney Docket No.	GMC 0050 PA/GP-303584

METHOD OF PAYMENT (check all that apply)

☒ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☐ Deposit Account Deposit Account Number: _____ Deposit Account Name: _____

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee
☐ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☐ Credit any overpayments

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	300	150	500	250	200	100	_____
Design	200	100	100	50	130	65	_____
Plant	200	100	300	150	160	80	_____
Reissue	300	150	500	250	600	300	_____
Provisional	200	100	0	0	0	0	_____

2. EXCESS CLAIM FEES

Fee Description	Fee (\$)	Small Entity Fee (\$)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims	Extra Claims	Fee (\$)	Fee Paid (\$)	Multiple Dependent Claims	Fee (\$)	Fee Paid (\$)
_____ - 20 or HP = _____	x _____	= _____				
HP = highest number of total claims paid for, if greater than 20						
Indep. Claims	Extra Claims	Fee (\$)	Fee Paid (\$)			
_____ - 3 or HP = _____	x _____	= _____				
HP = highest number of independent claims paid for, if greater than 3						

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
_____ - 100 = _____	/ 50 = _____	(round up to a whole number) x _____	= _____	

4. OTHER FEE(S)

Non-English Specification, \$130 fee (no small entity discount)

Other: Filing of Brief on Appeal

Fees Paid (\$)

500.00

SUBMITTED BY

Signature		Registration No. 42,695 (Attorney/Agent)	Telephone (937) 449-6400
Name (Print/Type)	William A. Jividen		Date June 9, 2006

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application of

Applicants : Goebel et al.
Serial No. : 10/669,479
Filed : September 24, 2003
Title : **FLOW FIELD PLATE ARRANGEMENT FOR A FUEL CELL**
Docket : GP-303584
Examiner : Robert W. Hodge
Art Unit : 1746
Conf. No. : 3973

CERTIFICATE OF MAILING
I hereby certify that this correspondence is being deposited with the United States Postal
Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box
1450, Alexandria, VA 22313-1450, on June 9, 2006.

Attorney William A. Jividen

Reg. No. 42,695

MAIL STOP APPEAL BRIEF - PATENTS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

BRIEF ON APPEAL

This is an appeal from the Office Action mailed January 19, 2006, finally rejecting claims 13-42, all of the claims in the application. A Notice of Appeal was timely mailed on April 10, 2006, with the accompanying fee. Our check in the amount of \$500 accompanies this Brief in accordance with 37 CFR §41.20(b)(2).

Real Party in Interest

The real party in interest in this application is General Motors Corporation, by an assignment from the named inventors recorded in the files of the U.S. Patent and Trademark Office on January 5, 2004 under Reel/Frame 014230/0465.

Related Appeals and Interferences

Applicants know of no currently pending related appeals or interferences that would have an effect on the outcome of this appeal.

06/12/2006 RFEKADU1 00000056 10669479

01 FC:1402

500.00 0P

Status of Claims

Claims 13-42 are pending in this application and are before this Board for consideration on appeal. A copy of the appealed claims is found in the Appendix attached to this Brief.

Status of Amendments

A Request for Reconsideration was filed March 17, 2006. In an Advisory Action dated March 28, 2006 it was indicated that the request for reconsideration has been considered but does not place the application in condition for allowance because the Applicants arguments are not persuasive for reasons already made of record in the final office action dated January 19, 2006.

Accordingly, independent claims 13 and 42 and the claims which depend therefrom, i.e. claims 14-41 respectively, as finally rejected, are the claims on appeal before this Board. A correct copy of the appealed claims appears as an Appendix to the Brief.

Summary of Claimed Subject Matter

Applicants' invention is directed to a fuel cell comprising anode and cathode flow field plates having a multitude of flow channels separated by land features wherein the land features of the anode side are wider than the land features of the cathode side. In fuel cells, the flow field plate arrangement of the present invention provides higher power (lower cost per kW), improved durability, and less stringent assembly alignment.

Grounds of Rejection to be Reviewed on Appeal

The grounds of rejection for review on appeal are:

(1) Claims 13-22, 24, 28, 31, 33-42 are rejected under 35 U.S.C. §102(e) as being anticipated by Carlstrom (US 2003/0224239).

(2) Claims 23, 25-27, 29, 30 and 32 are rejected under 35 U.S.C. §103(a) as being unpatentable over Carlstrom in view of Suzuki (US 2002/0004158).

Grouping of Claims

The Examiner has stated two grounds of rejection, rejecting claims 13-22, 24, 28, 31, 33-42 under 35 U.S.C. §102(e) as being anticipated by Carlstrom (US 2003/0224239) and claims 23, 25-27, 29, 30 and 32 under 35 U.S.C. §103(a) as being unpatentable over Carlstrom in view of Suzuki (US 2002/0004158).

This application contains two independent claims, claims 13 and 42. Applicants will separately argue the patentability of those claims in the body of their argument section. The dependent claims will stand or fall with their independent base claim.

Argument

Rejection under 35 U.S.C. §102(e).

In the Office Action, claims 13-22, 24, 28, 31, and 33-42 are rejected as anticipated by U.S. Pre-Grant Publication No. 2003/0224239, hereafter "Carlstrom." This rejection is respectively traversed in view of the following comments.

Carlstrom fails to disclose each and every limitation of the claimed invention. Nowhere in Carlstrom is it disclosed or suggested that a pitch of a first flow field plate is less than the pitch of a second flow field plate. The "pitch" of a flow field plate is defined in the specification as "the cross sectional width of the channel plus the cross sectional width of an adjacent land." See paragraph [0005] of the specification in the present invention.

In paper No. 20060111, para. 1, lines 11-17, the Examiner alleges that the Applicants are changing their definition of the term "pitch." However, in both the arguments filed 8/16/05 and 12/19/05, the Examiner has been directed to sections of the specification for the definition the term "pitch." In the augment filed 8/16/05, Applicants were responding to the Examiner's incorrect definition of the term pitch presented in the Office Action dated July 6, 2005 (paper No. 20050621). At that time, Applicants believed that it was unnecessary to expound on the definition of the term "pitch" provided at page 9, paragraph [0029] as the cited prior art was clearly deficient in having a pitch (land width plus channel width) defined by a first flow field plate that is less than a pitch (land width plus channel width) defined by a second flow field plate. Applicants were

apparently correct in this assertion as the Examiner drop the anticipatory rejections to Gurau et al., Suzuki et al., and Wilkinson et al. in the next Office Action dated October 7, 2005, and then provided the then newly cited reference to Carlstrom.

However, in view of the Examiner alleging in paper No. 20051003, para. 8, lines 3-7, that Carlstrom teaches that "the channels are designed to be varied in shape and pattern, where the channels can be different sizes, and cross sectional areas [*sic*] would therefore have varying land-to-land contact across the membrane with a pitch of one flow field plate being less than a pitch of another flow field plate in varying degrees and a thickness of the plate less than 1mm," it was obvious to the Applicants that the term "pitch" need to be expounded as the Examiner didn't understand context of the term as it had been clearly defined by the Applicants in the specification. Hence to make clear to the Examiner the meaning and context of the term "pitch," the Applicants pointed to paragraph [0005] of the specification in their response. Words of the claim must be given their plain meaning unless applicant has provided a clear definition in the specification. *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989); *Chef America, Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1372, 69 USPQ2d 1857 (Fed. Cir. 2004). Applicant have consistently pointed to the specification for the definition of the term "pitch," and have not wavered from that definition. Where an explicit definition is provided by the applicant for a term, that definition will control interpretation of the term as it is used in the claim. *Toro Co. v. White Consolidated Industries Inc.*, 199 F.3d 1295, 1301, 53 USPQ2d 1065, 1069 (Fed. Cir. 1999) (meaning of words used in a claim is not construed in a "lexicographic vacuum, but in the context of the specification and drawings"). See also MPEP 2111.01.

As Applicants have previously stated in their arguments filed 12/19/05, although channel shape and design vary between the embodiments disclosed by Carlstrom, the pitch does not vary between plates of each embodiment. To highlight this point, Applicants submitted Exhibit A in that response (herein provided as an Evidence Appendix) which shows FIGS. 5-7 of Carlstrom marked up to indicate that the pitch between the plates 502, 504 (FIG. 5), 602, 604 (FIG. 6), and 702, 704 (FIG. 7) of the illustrated embodiments are the same, and that even in the embodiment of Carlstrom, where only one of the plates 702 and 704 is provided with a ridge 706, 708 (see

paragraph [0050]), such an embodiment still has the same pitch between the plates. The Applicants have merely used an arbitrary scale in the Exhibit. The scale could have been in microns, inches, or paper clips, as the scale is irrelevant to the point that Carlstrom teaches and discloses in all his illustrated embodiments that the pitch is the same between the plates.

Nowhere in Carlstrom is it disclosed or suggested that a plate of one embodiment, for example, plate 505 (FIG. 5) can be paired up with the plate of another embodiment, for example, plate 608 (FIG. 6). However, even if one skilled was provided with such a suggested, such an embodiment would still not produce that claimed invention as Carlstrom is silent on the desire to vary the pitch between plates. In fact, none of the cited art provides such a desire. In view of the cited art, only inexpressible hindsight would provide such motivation to vary the pitch between plates.

Independent claim 13 recites, *inter alia*, the limitation of "a pitch defined by said first flow field plate is less than a pitch defined by said second flow field plate." Independent claim 42 recites, *inter alia*, the limitations of "said second channels define a cross sectional width approximately equal to a cross sectional width defined by said first channels, said second flow field plate defines a channel pitch substantially greater than a channel pitch defined by said first flow field plate." As Carlstrom fails to disclose or suggest such limitations, withdrawal of the anticipatory rejection to the above noted claims is respectfully requested.

Rejection under 35 U.S.C. §103(a) as being unpatentable over Carlstrom in view of Suzuki (US 2002/0004158).

In the Office Action, claims 23, 25-27, 29, 30, and 32 are rejected as being unpatentable over Carlstrom in view of Suzuki et al. U.S. Pre-Grant Publication No. 2002/0004158, hereafter "Suzuki et al." This rejection is respectively traversed in view of the following comments.

The above noted claims depend from claim 13, which as pointed out above, Carlstrom fails to teach the limitation of "a pitch defined by said first flow field plate is less than a pitch defined by said second flow field plate." As pointed out in the

arguments filed 8/16/05, Suzuki et al. also fail to disclose or suggest that a pitch of a cathode flow field plate is less than the pitch of an anode flow field plate.

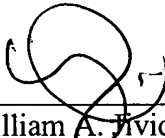
Applicants note that the cathode and anode separators (i.e., flow field plates), indicated as symbol 1 in FIG. 6 of Suzuki et al. are all provided with the same pattern, and hence the separators sandwiching the membrane electrode assembly (MEA)(elements 10, 11, and 12 in FIG. 6) will have the same cross-section and pitch. Nowhere in Suzuki et al. is it disclosed or suggested that a pitch of a cathode flow field plate is less than the pitch of an anode flow field plate. Furthermore, nowhere is it disclosed or suggested that the channels between two plates that are separated by a MEA have the same channel cross-section, yet one plate has a channel pitch greater than the other plate. Independent claim 13 recites, *inter alia*, the limitation of "a pitch defined by said first flow field plate is less than a pitch defined by said second flow field plate." Therefore, as the combined teachings of Carlstrom and Suzuki et al. would fail to disclose or suggest the recited invention of independent claim 13, withdrawal of this rejection to dependent claims 23, 25-27, 29, 30, and 32 is respectfully requested.

Conclusion

The Board is requested to reverse the rejections of claims 13-42 in their entirety.

Respectfully submitted,
DINSMORE & SHOHL LLP

By



William A. Fviden
Registration No. 42,695

One Dayton Centre
One South Main Street, Suite 1300
Dayton, Ohio 45402-2023
Telephone: (937) 449-6448
Facsimile: (937) 449-6405

WAJ/AMM

CLAIMS APPENDIX

1-12. (Canceled)

13. (Previously Amended) A device comprising an electrochemical cell, said electrochemical cell comprising:

 a membrane electrode assembly defining an anode side of said cell and a cathode side of said cell;

 a first flow field plate for the cathode side of said cell, said first flow field plate comprising a plurality of first channels separated by first lands; and

 a second flow field plate for the anode side of said cell, said second flow field plate comprising a plurality of second channels separated by second lands, wherein

 said membrane electrode assembly is interposed between said first and second flow field plates, and

 a pitch defined by said first flow field plate is less than a pitch defined by said second flow field plate.

14. (Original) The device according to claim 13 wherein the pitch defined by said second flow field plate is approximately twice as large as the pitch defined by said first flow field plate.

15. (Original) The device according to claim 13 wherein at least one of said second lands has a cross sectional width wider than a cross sectional width of at least one of said first lands.

16. (Original) The device according to claim 13 wherein said first channels define a cross sectional width approximately equal to a cross sectional width defined by said second channels.

17. (Original) The device according to claim 13 wherein a substantial number of said second lands define a cross sectional width greater than a cross sectional width defined by a substantial number of said first lands.

18. (Original) The device according to claim 13 wherein a substantial number of said second channels define a cross sectional width approximately equal to a cross sectional width defined by a substantial number of said first channels.
19. (Original) The device according to claim 13 wherein a majority of said second lands define a cross sectional width greater than a cross sectional width defined by a majority of said first lands.
20. (Original) The device according to claim 13 wherein a majority of said first channels define a cross sectional width approximately equal to a cross sectional width defined by a majority of said second channels.
21. (Original) The device according to claim 13 wherein substantially all of said second lands define a cross sectional width greater than a cross sectional width defined by substantially all of said first lands.
22. (Original) The device according to claim 13 wherein substantially all of said first channels define a cross sectional width approximately equal to a cross sectional width defined by substantially all of said second channels.
23. (Original) The device according to claim 13 wherein said first and second channels each have a cross sectional width of 1.5 mm or less.
24. (Original) The device according to claim 13 wherein each of said flow field plates have a thickness of 1 mm or less.
25. (Original) The device according to claim 13 wherein a cross sectional width of each said first lands is 1mm or less.

26. (Original) The device according to claim 13 wherein a cross sectional width of each said second lands is about 3 times wider than a cross sectional width of each said first lands.

27. (Original) The device according to claim 26 wherein said first channels define a cross sectional width approximately equal to a cross sectional width defined by said second channels.

28. (Original) The device according to claim 13 wherein said first and second channels are predominately straight.

29. (Original) The device according to claim 13 wherein said first and second channels each have a depth of about 1 mm or less.

30. (Original) The device according to claim 13 wherein the pitch defined by said first flow field plate is about 2.5 mm or less.

31. (Original) The device according to claim 13 wherein said device further comprises structure defining a fuel cell of the PEM-type.

32. (Original) The device according to claim 31 wherein said device further comprises structure defining a vehicle powered by said fuel cell.

33. (Original) The device according to claim 13 wherein said second lands are oriented at an angle to said first lands in a plane parallel to said second flow field plate.

34. (Original) The device according to claim 33 wherein said angle is in the range of 0° to 90°.

35. (Original) The device according to claim 13 wherein said first and second fluid flow plates lie in substantially parallel planes and said first channels, said first lands, said

second channels, and said second lands define respective pitches that ensure at least about 30% land-to-land contact across a surface of a membrane interposed between said first and second flow field plates.

36. (Original) The device according to claim 35 wherein said respective pitches ensure at least about 30% land-to-land contact regardless of the manner in which said first lands are aligned relative to said second lands.

37. (Original) The device according to claim 13 wherein at least one of said first and second channels are formed with a multiple of alternating angles.

38. (Original) The device according to claim 13 wherein said first and second lands each have a wiggle alignment pattern, and each said wiggle alignment pattern is in phase respectively.

39. (Original) The device according to claim 13 wherein said first and second lands each have a wiggle alignment pattern and each said wiggle alignment pattern is out of phase respectively.

40. (Previously Amended) The device according to claims 33 wherein said first and second channels are predominately straight.

41. (Original) The device according to claims 13 wherein said first and second channels are serpentine.

42. (Previously Amended) A device comprising an electrochemical cell, said electrochemical cell comprising:

 a membrane electrode assembly defining an anode side of said cell and a cathode side of said cell;

 a first flow field plate for the cathode side of said cell, said first flow field plate comprising a plurality of first channels separated by first lands; and

a second flow field plate for the anode side of said cell, said second flow field plate comprising a plurality of second channels separated by second lands, wherein
said membrane electrode assembly is interposed between said first and second flow field plates,
said second channels define a cross sectional width approximately equal to a cross sectional width defined by said first channels,
said second flow field plate defines a channel pitch substantially greater than a channel pitch defined by said first flow field plate, and
at least said second lands are formed with a multiple of alternating angles relative to said first lands in a plane parallel to said second flow field plate and said respective channel pitches and cross-sectional widths ensure at least 30% land-to-land contact which is insensitive to plate-to-plate positioning.

EVIDENCE APPENDIX

Exhibit A: FIGS. 5-7 of Carlstrom marked up to indicate that the pitch between the plates 502, 504 (FIG. 5), 602, 604 (FIG. 6), and 702, 704 (FIG. 7) of the illustrated embodiments are the same. Entered in Applicants' response filed 12/19/05.

Serial No 10/669,479
Atty. Dkt. No. GP-303584

RELATED PROCEEDINGS APPENDIX

NONE



COPY

PTO/SB/17 (12-04)

Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number

Effective on 12/08/2004.

Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL

For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 500.00

Complete if Known

Application Number 10/669,479
Filing Date September 24, 2003
First Named Inventor Steven Goebel et al.
Examiner Name Robert W. Hodge
Art Unit 1746
Attorney Docket No. GMC 0050 PA/GP-303584

METHOD OF PAYMENT (check all that apply)

☒ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☐ Deposit Account Deposit Account Number: _____ Deposit Account Name: _____

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee
☐ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☐ Credit any overpayments

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee (\$)	Small Entity Fee (\$)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims - 20 or HP = _____ x _____ = _____ Fee Paid (\$)
HP = highest number of total claims paid for, if greater than 20
Indep. Claims - 3 or HP = _____ x _____ = _____ Fee Paid (\$)
HP = highest number of independent claims paid for, if greater than 3

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets - 100 = _____ / 50 = _____ (round up to a whole number) x _____ = _____ Fee Paid (\$)

4. OTHER FEE(S)

Non-English Specification, \$130 fee (no small entity discount)

Other: Filing of Brief on Appeal

Fees Paid (\$)

500.00

SUBMITTED BY

Signature _____ Registration No. 42,695 Telephone (937) 449-6400
Name (Print/Type) William A. Jivden Date June 9, 2006

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

EXHIBIT A (PAGE 1 OF 2)

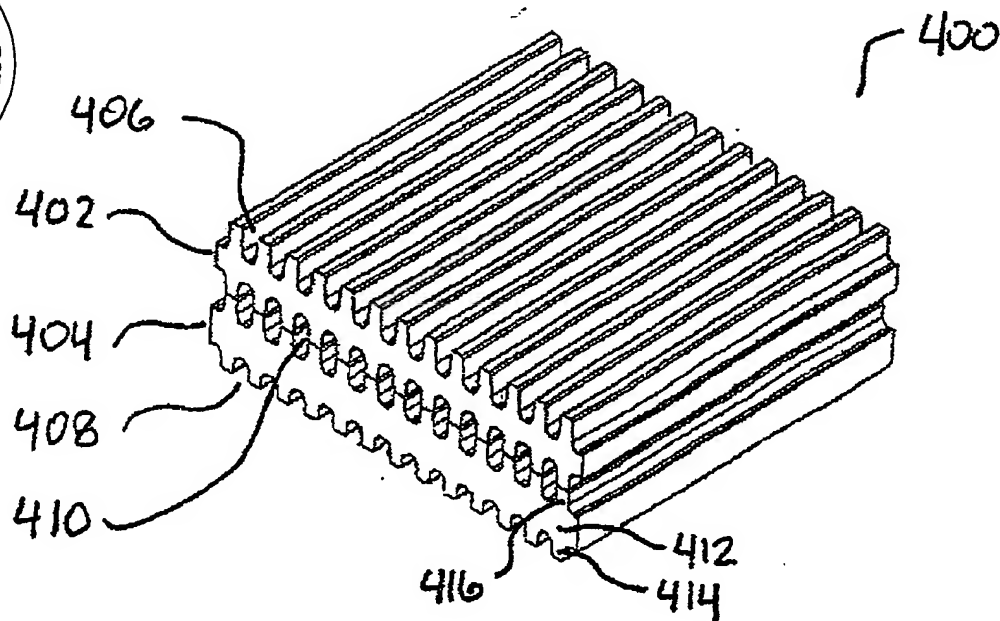


Fig. 4 (Prior Art)

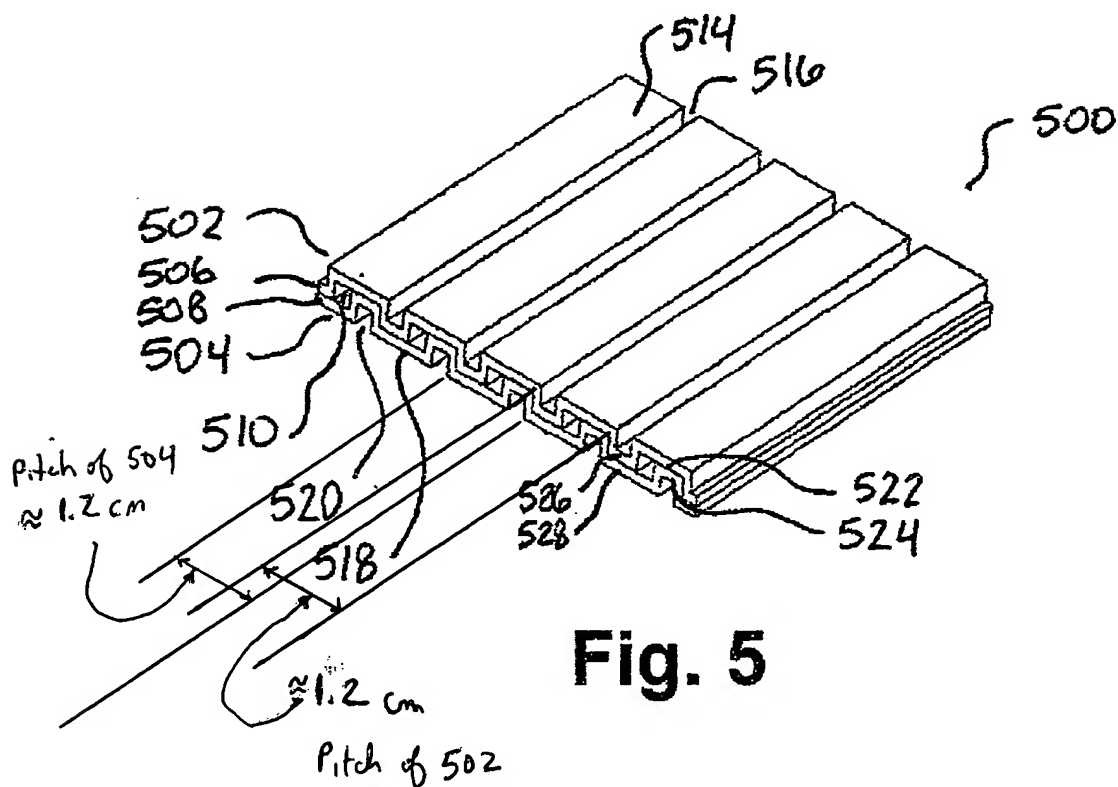


Fig. 5

EXHIBIT A (PAGE 2 OF 2)

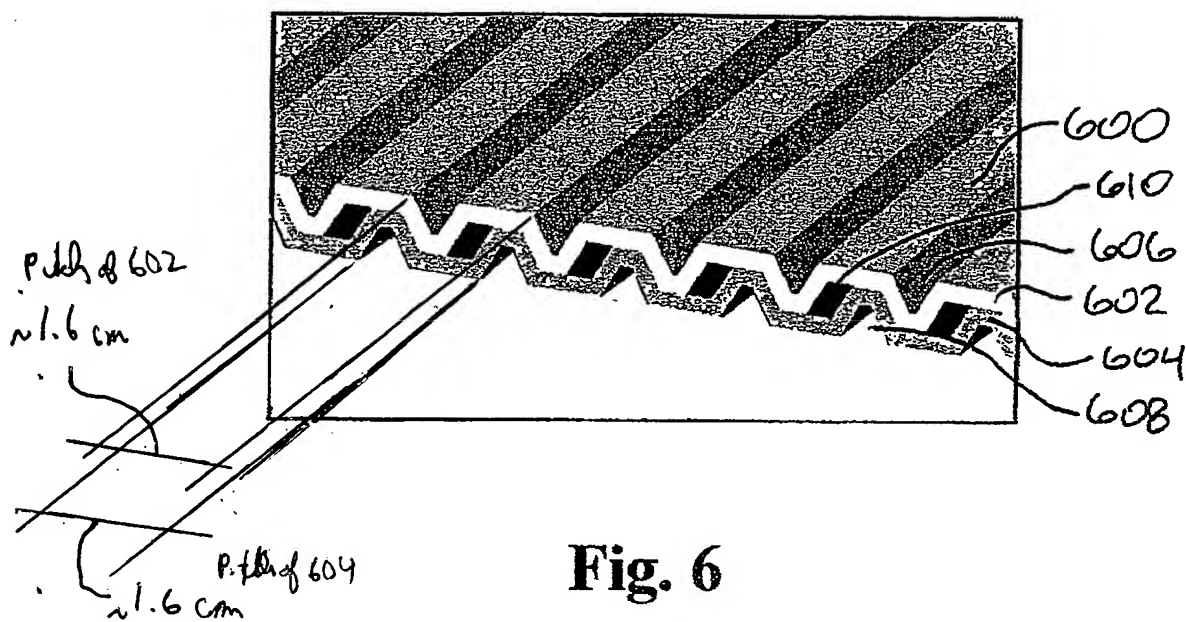


Fig. 6

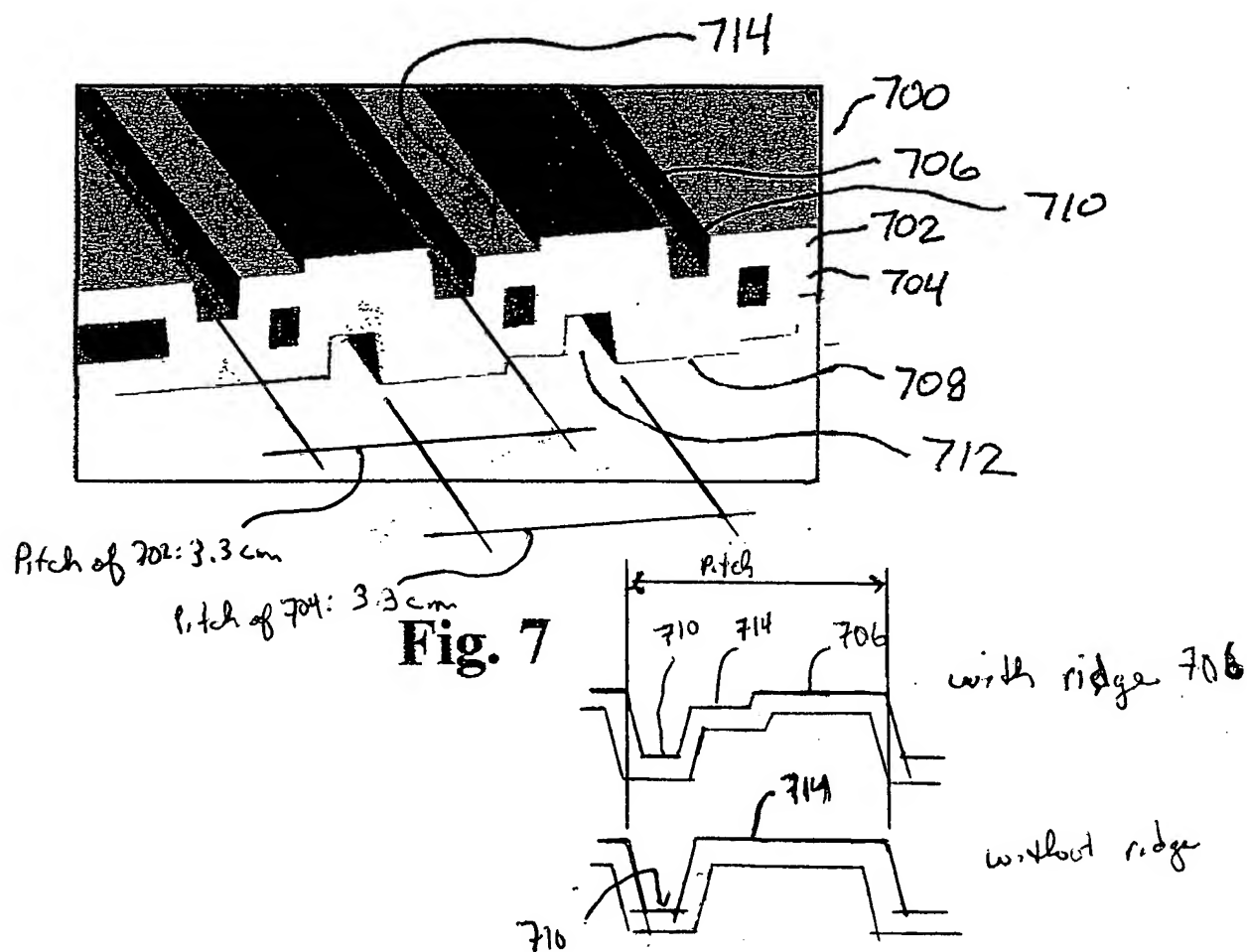


Fig. 7